

the increase in minute ventilation (V_E) or the increase in forearm vascular conductance (FVC) against the increase in esophageal temperature (T_{es}) ($\Delta V_E/\Delta T_{es}$ and $\Delta FVC/\Delta T_{es}$, respectively). Regression analysis revealed that $\Delta V_E/\Delta T_{es}$ had negative relationships with VO_{2peak} (exponential; $r=-0.50$, $p<0.05$) and $\Delta FVC/\Delta T_{es}$ (linear; $r=-0.48$, $p<0.05$), and there is a positive linear relationship between $\Delta FVC/\Delta T_{es}$ and VO_{2peak} ($r=0.71$, $p<0.01$). These results suggest that the ventilatory response to increasing body temperature is influenced by physical fitness or heat acclimatization.

2-3 Effect of Hyperoxia on Thermoregulatory and Subjective Responses during Submaximal Exercise

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This research was conducted to study the effect of hyperoxia on thermoregulatory and subjective responses of human subjects during exercise. Eight, healthy male subjects (22–26 yrs.) performed exercise on an ergometer at 60% and 40% VO_2 max in a climatic chamber set at 21% and 30% O_2 concentration condition with the ambient temperature set at 26°C and relative humidity at 50%. Subjects cycled for 30 min on different days and in random order with a minimum of 1-day interval. Measurements included skin temperature at 7 sites, rectal (T_{re}) and mean skin (T_{sk}) temperature, laser Doppler flowmeter (LDF) and mean sweat rate (Msw) on the forearm, back and thigh, heart rate (HR), blood pressure (BP) and body weight loss (BWL). Subjective parameters were thermal comfort, thermal sensation, rate of perceived sweating, dyspnea grade and rate of perceived exertion (RPE). The results of this study revealed that submaximal exercise in 30% hyperoxic condition produced lower increases in skin and rectal temperature, and heart rate which may have induced lower RPE and thermal sensation.

2-4 A Study of Weber's Law on Human's Sensory Characteristics of Exerted Force by Hand

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To design operational equipments by hand that feel easy-to-use and suitable, it is necessary to study human's sensory characteristics of force exerted by hand. However, the researches about voluntary exerted force (active sense) are not enough. Therefore, we have studied the human's sensory characteristic of voluntary exerted force on actual operating position. In this research, we focused on the following:

- 1) A verification of the Weber's law: The ratio of the minimum value of exerted force to the prior load force (initial exerting force).
- 2) A comparison of directional dependency of minimum value of forces/torques.

We made the joystick contains the six axes forces/torques sensor to measure absolute forces/torques exerted by right hand. 10 males and 7 females participated in this experiment. In the result, the minimum force/torque increases in proportion to the increase in the prior load force. And the Weber's ratio is close to around 0.1 in proportion to the increase in the standard force. These results suggested the possibility that the Weber's law is applicable. And the minimum torque of radial flexion is larger than those in the other torque components. In this direction, the control of power might be more difficult than other directions.

2-5 Search for SNP Allele at Multiple Loci Associated with Human Skin Color Diversity and a Study of Spatial Distribution of SNP Allele at Multiple Loci Associated with Human Skin Color Diversity using RS/GIS

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Our study aims to search for SNP allele at multiple loci associated with human skin color diversity using SNP genotyping; and to study spatial distribution of SNP allele at multiple loci associated with the diversity using remote sensing (RS) and geographic information systems (GIS). A total of 122 Caucasians living in Toledo, Ohio and 100 Japanese were genotyped for 20 SNPs at 7 loci in candidate genes. Data obtained from the SNP genotyping were used to analyze associations of 20 SNPs by use of linkage disequilibrium (LD). Combinations of SNP alleles under LD were constructed for low and high melanin groups and racial groups. RS data as ecological approach were integrated into a GIS to identify spatial distribution of UV irradiation that determines the diversity. Results show that SNP allele at multiple loci, which contribute to the variation suggesting high possibility of LD. There were interactions among skin color, SNP allele at multiple loci and UV irradiation. Our study plans to collect data on other ethnic groups in order to analyze correlation between SNP allele at multiple loci and racial difference. Our final goal is to clarify environmental adaptability to ultraviolet irradiation in order to predict human health risk influenced by severe environments in the future.

2-6 An Association between Plasma Homocysteine Concentration and Methylenetetrahydrofolate Reductase Gene C677T Polymorphism on a Remote Japanese Island

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It has been reported that hyperhomocysteinemia is caused by genetic and environmental factors. A common genetic factor is methylenetetrahydrofolate reductase (MTHFR) gene C677T

polymorphism. Since there are few studies regarding plasma homocysteine concentration and MTHFR gene polymorphism in a remote island population, we investigated the association between MTHFR gene polymorphism and homocysteine on Goto Islands. We defined small remote islands as an island with population of less than 1000, large island as Fukue Island (the population: 43,331) and mainland as Unzen City (the population: 52,230). The study comprised 1,468 cases (149 on small remote islands, 1030 in the large island, 289 in the mainland). The plasma homocysteine concentration in cases from the small remote island ($11.3 \mu\text{mol/l}$) was significantly higher than that in other areas ($8.8 \mu\text{mol/l}$ large island, $6.5 \mu\text{mol/l}$ mainland) after adjustments for age and sex. However, there was no difference in the frequency of MTHFR gene polymorphism. We suggest that the difference was caused by environmental factors rather than genetic factors. Additional investigations of other factors are needed in the future.

2-7 Brain Histamine H₁ Receptor Occupancy of Orally-administered Antihistamines, Measured by PET with ¹¹C-doxepin

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Antihistamines are frequently used for treatment of various allergic diseases but often induce sedation. The strength of sedation can be evaluated by measuring histamine H₁ receptor (H₁R) occupancy in the brain using positron emission tomography (PET). The purpose of the present study is to measure H₁R occupancy of bepotastine, a new second-generation antihistamine, and to compare it to that of diphenhydramine. Eight healthy male volunteers (24.4 ± 3.3 years old) were studied after single oral administration of bepotastine 10 mg, diphenhydramine 30 mg or placebo, using PET with ¹¹C-doxepin in a crossover study-design. H₁R occupancy after bepotastine treatment was significantly lower than that after diphenhydramine treatment in the all cortical regions ($p < 0.001$). Overall cortical mean H₁RO of bepotastine and diphenhydramine were 14.8% and 56.8%, respectively. H₁R occupancy of both bepotastine and diphenhydramine correlated to their respective drug plasma concentration ($p < 0.001$).

2-8 Correlation between Baseline Value and Amount of Change in Salivary Cortisol Concentration and Salivary Immunoglobulin A Concentration

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Baseline values of salivary cortisol concentration and salivary immunoglobulin A (IgA) concentration have been reported to show large individual differences. The aim of the

present study was to clarify the relationship between the baseline value (the concentration at the rest state) and the amount of change under pleasant (forest) and stressful (city) environments in salivary cortisol concentration and salivary IgA concentration. The subjects were 84 male students (22.2 ± 1.6 years old), who gave their written informed consent. Saliva was sampled four times, i.e., before and after the subjects walked a predetermined course for 10–15 minutes, and before and after they were seated watching the landscape for 10–15 minutes in forest and city environments. A significant negative correlation between the baseline value and the amount of change when walking and watching was found both in cortisol and IgA. The correlation was stronger in the cortisol than in the IgA when walking than when watching, and stronger in the forest environment than in the city environment. The findings in the present study will contribute to the interpretation of the individual differences in the cortisol and IgA responses.

2-9 Quantification of Subjects' Breathing Method using the Index of Respiratory Regularity

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The aim of this study is quantification of subjects' breathing method using the index of respiratory regularity (IRR) we proposed in the 55th Meeting of JSPA. First, the theoretical properties of the IRR were examined by applying it to computer-generated pseudo respiratory curves, that is, AM and FM waves modulated by normal random signals. The irregularities of the curves were controlled by these modulation factors. The results showed a positive linear relation between the modulation factors and the IRR on a double-logarithmic scale. Second, the IRR was applied to subjects' respiratory curves when subjects breathed with controlled respiration (0.25 Hz) and with voluntary respiration. The calculated IRR has lower stable value with controlled respiration, and higher unstable value with voluntary respiration. Moreover, interpersonal and intrapersonal variance of subjects' breathing method could be seen from the time trend of the IRR. In conclusion, the IRR could quantitatively describe the subjects' breathing method. Our future plan is the application of the IRR to quantitative evaluation of the estimated accuracy of autonomic nervous system activity by heart rate variability.